

Candelas, Philip; de la Ossa, Xenia; Font, Anamaría; Katz, Sheldon; Morrison, David R.
Mirror symmetry for two-parameter models. I. (English) Zbl 0899.14017
Nucl. Phys., B 416, No. 2, 481-538 (1994).

Summary: We study, by means of mirror symmetry, the quantum geometry of the Kähler-class parameters of a number of Calabi-Yau manifolds that have $b_{11} = 2$. Our main interest lies in the structure of the moduli space and in the loci corresponding to singular models. This structure is considerably richer when there are two parameters than in the various one-parameter models that have been studied hitherto. We describe the intrinsic structure of the point in the (compactification of the) moduli space that corresponds to the large complex structure or classical limit. The instanton expansions are of interest owing to the fact that some of the instantons belong to families with continuous parameters. We compute the Yukawa couplings and their expansions in terms of instantons of genus zero. By making use of recent results of Bershadsky and others we compute also the instanton numbers for instantons of genus one. For particular values of the parameters the models become birational to certain models with one parameter. The compactification divisor of the moduli space thus contains copies of the moduli spaces of one-parameter models. Our discussion proceeds via the particular models $P_4^{1,1,2,2,2}$ [*P. M. H. Wilson*, *Invent. Math.* 107, No. 3, 561-593 (1992; [Zbl 0766.14035](#))] and $P_4^{1,1,2,2,6}$ [*P. Berglund, P. Candelas, X. de la Ossa, A. Font, T. Hübsch, D. Jančić and F. Quevedo*, *Nucl. Phys.*, B 419, No. 2, 352-403 (1994; [Zbl 0896.14022](#))].
[See also part II of this paper, *Nucl. Phys.*, B 429, No. 3, 626-674 (1994; see the following review)].

MSC:

[14J32](#) Calabi-Yau manifolds (algebraic-geometric aspects)
[14D20](#) Algebraic moduli problems, moduli of vector bundles
[32Q15](#) Kähler manifolds

Cited in **2** Reviews
Cited in **69** Documents

Keywords:

Hodge class; mirror symmetry; quantum geometry; Calabi-Yau manifolds; moduli space; Yukawa couplings; instantons

Full Text: [DOI](#) [arXiv](#)

References:

- [1] Candelas, P.; de la Ossa, X.; Green, P.; Parkes, L., *Nucl. phys.*, B359, 21, (1991)
- [2] Morrison, D.R., Picard-Fuchs equations and mirror maps for hypersurfaces, () · [Zbl 0904.32020](#)
- [3] Font, A., *Nucl. phys.*, B391, 358, (1993)
- [4] Klemm, A.; Theisen, S., *Nucl. phys.*, B389, 153, (1993)
- [5] Aspinwall, P.S.; Greene, B.R.; Morrison, D.R.; Aspinwall, P.S.; Greene, B.R.; Morrison, D.R., *Phys. lett.*, *Nucl. phys.*, B416, 414, (1994)
- [6] Bershadsky, M.; Cecotti, S.; Ooguri, H.; Vafa, C., *Nucl. phys.*, B405, 279, (1993), with an appendix by S. Katz
- [7] S. Hosono, A. Klemm, S. Theisen and S.-T. Yau, Mirror symmetry, mirror map, and application to Calabi-Yau hypersurfaces, preprint · [Zbl 0814.53056](#)
- [8] Wilson, P.M.H., *Invent. math.*, 107, 561, (1992)
- [9] Greene, B.R.; Plesser, M.R., *Nucl. phys.*, B338, 15, (1990)
- [10] Libgober, A.; Teitelbaum, J., *Intern. math. res. notices*, 29, (1993)
- [11] V. Batyrev and D. van Straten, Generalized hypergeometric functions and rational curves on Calabi-Yau complete intersections in toric varieties, preprint *alg-geom/9307010* · [Zbl 0843.14016](#)
- [12] P. Berglund, P. Candelas, X. de la Ossa, A. Font, T. Hübsch, D. Jančić and F. Quevedo, Periods for Calabi-Yau and Landau-Ginzburg vacua, preprint CERN-TH.6865/93, HUPAPP-93/3, NEIP 93-004, NSF-ITP-93-96, UTTG-13-93 [*hep-th* 9308005]
- [13] Markushevich, D.G., Resolution of singularities (toric method), *Commun. math. phys.*, 111, 247, (1987), appendix to D.G. Markushevich, M.A. Olshanetsky and A.M. Perelomov
- [14] Ceresole, A.; D'Auria, R.; Ferrara, S.; Lerche, W.; Louis, J., *Intern. J. mod. phys.*, A8, 79, (1993)

- [15] D.R. Morrison, Compactifications of moduli spaces inspired by mirror symmetry, preprint DUK-M-93-06
- [16] Landman, A., Trans. amer. math. soc., 181, 89, (1973)
- [17] Cadavid, A.C.; Ferrara, S., Phys. lett., B267, 193, (1991)
- [18] Blok, B.; Varchenko, A., Intern. J. mod. phys., A7, 1467, (1992)
- [19] Lerche, W.; Smit, D.J.; Warner, N.P., Nucl. phys., B372, 87, (1992)
- [20] Deligne, P., Equations différentielles à points singuliers réguliers, () · [Zbl 0244.14004](#)
- [21] Katz, N., Publ. math. IHES, 39, 175, (1971)
- [22] P. Berglund and S. Katz, Mirror symmetry for hypersurfaces in weighted projective space and topological couplings, preprint · [Zbl 0990.32500](#)
- [23] Aspinwall, P.S.; Greene, B.R.; Morrison, D.R., Intern. math. res. notices, 319, (1993)
- [24] Batyrev, V.V., Dual polyhedra and mirror symmetry for Calabi-Yau hypersurfaces in toric varieties, (November 1992), preprint
- [25] Roan, S.-S., Intern. J. math., 2, 439, (1991)
- [26] Oda, T.; Park, H.S., Tôhoku math. J., 43, 375, (1991)
- [27] Batyrev, V.V., Duke math. J., 69, 349, (1992)
- [28] Aspinwall, P.S.; Morrison, D.R., Commun. math. phys., 151, 245, (1993)
- [29] Witten, E., Nucl. phys., B403, 159, (1993)
- [30] S.A. Strømme and D. van Straten, private communication
- [31] G. Ellingsrud and S.A. Strømme, in preparation
- [32] S. Katz, Rational curves on Calabi-Yau manifolds: verifying predictions of mirror symmetry, preprint OSU-M-92-3
- [33] Klemm, A.; Theisen, S., Mirror maps and instanton sums for complete intersections in weighted projective space, Preprint LMU-TPW-93-08, (1993)
- [34] McDuff, D., Invent. math., 89, 13, (1987)
- [35] P.S. Aspinwall, B.R. Greene and D.R. Morrison, Measuring small distances in $\text{N} = 2$ sigma models, preprint IASSNS-HEP-93/49 · [Zbl 0990.81689](#)

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